

Composite Cores

At right, an automatic machine at Magnetix, Division of Spang and Company, Butler, Pennsylvania is slitting strips of magnetic nickel-iron alloy tape prior to winding them into composite cores for use in the transformers of electronic systems. At right center, a Magnetix employee is assembling ring-shaped segments into complete cores, which go to an oven for application of a baked-on epoxy protective coating (below).

The composite toroidal (doughnut-shaped) core was developed by the Electric Power System Section of Jet Propulsion Laboratory (JPL) in response to a problem—failure of the switching transistors of a voltage converter—experienced in a spacecraft. Investigation showed that “saturation”—a power surge—of the core of the converter transformer sometimes causes a large voltage “spike” that often destroys the switching transistors.

JPL's solution was to redesign the cores of converter transformers to provide an air gap with a powerful demagnetizing effect. The term “composite” here means that the new configuration is a composite of gapped and ungapped cores assembled together in concentric relationship. The net effect of the composite design is to combine the protection from saturation offered by the gapped core with the lower magnetizing requirement of the ungapped core. The uncut core functions under normal operating conditions and the cut core takes over during abnormal operation to prevent power surges and their potentially destructive effect on transistors.

Magnetix manufactures the cores under NASA license. Principal customers are aerospace and defense manufacturers who use the cores in power supplies for high reliability space and military applications. The cores also have applicability in commercial products where precise power regulation is required, as in the power supplies for large mainframe computers.

